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RESPONSE TO VARYING LEVELS OF CONDITIONING REWARDS. FINAL REPORT.

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DESCRIPTORS- *RESEARCH PROJECTS, *BEHAVIORAL SCIENCE RESEARCH, *CONDITIONED RESPONSE, *KINDERGARTEN CHILDREN, STIMULUS BEHAVIOR, COMPARATIVE TESTING, *REWARDS, ASSOCIATIVE LEARNING, UNDERACHIEVERS, METROPOLITAN READINESS TEST,

TWO EXPERIMENTS WERE CONDUCTED TO CLASSIFY AND TO CONDITION REWARD RESPONSIVENESS IN KINDERGARTEN CHILDREN. IN THE FIRST EXPERIMENT, 207 CHILDREN WITH A MEDIAN AGE OF 6.0 WERE CLASSIFIED ACCORDING TO THEIR RESPONSIVENESS TO A HIERARCHY OF REWARDS. AFTER TWO SESSIONS INVOLVING TWO-CHOICE INSTRUMENTAL CONDITIONING TASKS, 60 PERCENT OF THE CHILDREN WERE CLASSIFIED AS RESPONSIVE TO TANGIBLE REWARDS, 30 PERCENT AS RESPONSIVE TO SOCIAL APPROVAL (HALF OF WHICH WERE ALSO RESPONSIVE TO CONFIRMATION OF CORRECT RESPONSE), AND 10 PERCENT AS UNRESPONSIVE TO ANY OF THE THREE REWARDS. IN A THIRD SESSION, STIMULI WERE PAIRED TO CONDITION THE CHILDREN TO BECOME RESPONSIVE TO PREVIOUSLY NONREWARDING STIMULI. A FINAL SESSION WAS DEVOTED TO EVALUATION OF THE EFFECTIVENESS OF THE NEWLY ESTABLISHED REWARDS. DATA FROM THIS EXPERIMENT SHOWED THAT TANGIBLE REWARDS WERE MORE EFFECTIVE FOR KINDERGARTEN CHILDREN THAN WERE APPROVAL REWARDS AND THAT APPROVAL REWARDS AND CONFIRMATION OF CORRECT RESPONSES WERE EQUALLY EFFECTIVE AND POSITIVELY CORRELATED. IN THE SECOND EXPERIMENT, INVOLVING 90 KINDERGARTEN CHILDREN, IT WAS FOUND THAT A NEUTRAL WORD CAN BE CONDITIONED TO BECOME A REWARD STIMULUS AND THAT CONDITIONING IS STRENGTHENED BY A PERIOD OF REWARD DEPRIVATION. EVIDENCE WAS ALSO OBTAINED SHOWING THAT CHILDREN WHO ARE UNDERACHIEVERS TEND TO BE LOWER IN APPROVAL RESPONSIVENESS. THESE FINDINGS SUGGEST CERTAIN PROCEDURES TO BE EMPLOYED IN ESTABLISHING ACHIEVEMENT MOTIVATION AMONG KINDERGARTEN CHILDREN. DETAILED STATISTICS ARE REPORTED IN 24 TABLES. (JS)

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Summary

This research makes use of a conditioning model. Conditioned rewards are represented as deriving their reward effects from association with other rewards. In terms of the model, social approval is rewarding if it has been associated with other rewards, usually tangible rewards. Confirmation of correct responses that is, saying "Correct" or "That's right" is rewarding if it has been associated with approval, and the ability to use self confirmation and self reward derives from association with external confirmation and approval.

Two experiments were conducted.

Experiment 1

The following hypotheses were tested in Experiment 1:

I Tangible rewards are more effective with kindergarten children than are approval rewards and approval is more effective than confirmation of correct responses.

II a) Social approval can be conditioned to become a reward in children for whom it is not rewarding by pairing approval words with tangible rewards.

b) The confirmation of correct responses can be conditioned in children for whom it is not rewarding by pairing confirmation with approval.

c) Self reward can be conditioned to control the behavior of learning by pairing self-reward responses with approval and confirmation of correct responses.

III Conditions which influence the strength of a reward will affect the power of that reward to condition other rewards. When a nonrewarding stimulus is paired with a previously deprived reward stimulus the nonrewarding stimulus will acquire reward powers more readily than when paired with a nondeprived reward.

Method. -- A total of 207 kindergarten children, ages 5.5 to 6.8 with a median age of 6.0, participated. There were three overlapping phases. In the first phase the children were classified according to their reward responsiveness. Two experimental sessions involving two-choice instrumental conditioning tasks were used to determine which children were responsive to (1) tangible rewards (trinkets, small toys, candy) (2) social approval ("Good" "Excellent" etc) and (3) confirmation of correct responses ("That's correct," "That's right" etc).

In the second phase an attempt was made to condition the children who were responsive only to tangible rewards to become responsive to approval as well. This was done in a third experimental session in which tangible rewards and approval were paired. The children who were responsive to approval but not to confirmation of correct responses were conditioned to respond to confirmation by pairing it with approval. The children who were responsive to confirmation were conditioned to provide

self reward.

The third phase of the project was devoted to evaluation. In a fourth experimental session the children who had been taught to respond to approval and those that had been taught to respond to confirmation were tested to determine the effectiveness of the newly established rewards. The children who had been conditioned to use self-reward were tested by observing how well they learned from a programmed self-instructional lesson.

Results. -- The data from Experiment 1 showed:

(1) Sixty percent of the children qualified, in terms of the criteria used here, as tangible-reward responsive; thirty percent qualified as approval responsive of whom 50 percent also qualified as responsive to confirmation of correct responses, and 10 percent did not qualify for any of the three groups.

(2) Tangible rewards were more effective for kindergarten children than were approval rewards.

(3) Approval rewards and confirmation of correct responses were equally effective and were positively correlated.

(4) The conditioning procedures were not more effective than the control-group procedures in which no systematic conditioning was done.

Experiment 2

The objectives of Experiment 2 were as follows:

(1) To determine whether a nonrewarding verbal stimulus such as the nonsense word "Maygleen" could be conditioned to serve as a reward stimulus for kindergarten children.

(2) To determine if the conditioning of a reward requires that the stimulus to be conditioned be a discriminative stimulus (S^D).

(3) To determine whether the deprivation of reward during the process of conditioning has an effect upon the conditioning.

Method. -- Ninety kindergarten children participated. In the first of two sessions, the children were randomly assigned to one of four groups. Group A (n = 40) was conditioned according to a procedure in which the stimulus to be conditioned as a reward first served as a discriminative stimulus (S^D). For this group the conditioning sequence also included a period of 15 successive trials during which the conditioned stimulus was not paired with a tangible reward (deprivation period). Group B (n = 20) was treated the same as A except for the deprivation period. The children in B were not deprived of tangible rewards during conditioning. Group C (n = 20) did not have the S^D procedure, but they were exposed to the 15 trials of deprivation. Group D (n = 10) was a control group in which one word was conditioned and another word tested in the first session.

In the second session one day later, one half of the children in Group A were tested by determining whether the conditioned reward from the first session would influence preference for one of two games played in the second session. One game was rewarded with the conditioned reward and the other with a new nonsense word. The other half of Group A, Group A1, were tested with the conditioned reward for one game and a nonsense word that had appeared in the first session but that had not been paired with the tangible rewards.

Groups B and C were treated in the same manner as A in the second session.

Results. -- The data showed that the quickest and most durable reward conditioning occurred in Group A, the group exposed to the S^D procedure and the deprivation trials during conditioning. No evidence of conditioning was found for Group B, the group not exposed to deprivation. Some evidence of conditioning was found for Group C, the group exposed to deprivation but not to the S^D procedure. The conditioning did not show up in this group until after the deprivation conditioning trials.

Conclusions. -- Support was found for the hypothesis that tangible rewards are generally more effective than approval rewards for kindergarten children.

The results of Experiment 2 showed that a neutral word, in this case a nonsense word, can be conditioned to become a reward stimulus. The conditioning procedures used indicated that the best way to condition a reward stimulus is to make the stimulus an S^D and then arrange for a deprivation-of-reward period during the conditioning sequence in which reward is paired with the stimulus.

The classification of kindergarten children into tangible-responsive and approval-responsive appeared to be reliable. Additional data were obtained to determine the predictive validity of such a classification. These data, the Metropolitan Readiness Test, Form R scores of the children and their first-grade teachers' ratings of their achievement, indicated that underachievers who initially score in the 80th percentile or above on the Metropolitan Test tend to be low in approval responsiveness.

These additional data have important implications for a pragmatic approach to the study and management of classroom motivation. If achievement in some situations is related to approval responsiveness, and if approval responsiveness can be conditioned, then positive steps could be taken to increase such responsiveness where it is low or to establish it where it is lacking.

These findings should be followed by additional research that investigates more fully reward responsiveness and school achievement and that investigates further the ways to establish the reward function of a stimulus.

Experiment 1

Introduction

The purpose of this research was to identify and classify certain rewards[1] that may be used in teaching five and six-year-old children and to study the means of conditioning effective rewards.

Related Research. -- There is a large body of research which deals with reward and with incentive motivation. Much of this research is based on studies of infrahuman organisms and is not directly pertinent to the problem area with which this research deals. The related research with infrahuman organisms is carefully summarized and reviewed by Cofer & Appley (1964). The research dealing with human reinforcement variables is becoming extensive. Since the early 1950s there has been an increasing number of studies in which conditioned rewards have been used to control verbal behavior. Many of the early studies in this area of research have been reviewed by Krasner (1958). In the late 1950s a number of investigators turned their attention to the modification of behavior by means of reinforcement techniques. Certain of these studies are directly related to the research performed here and are cited below.

The studies of direct concern to this research may be classified into three groups. One group deals largely with the distinction between various types of rewards and with individual differences. A second group deals with the variables which influence reward effectiveness. A third group, the smallest group, deals with the establishing of effective rewards.

In the first group of studies the most attention has been paid to tangible rewards such as toys, candy, money etc. and to social approval reward given in the form of statements or words of praise. The use of different types of tangible rewards has been discussed by Bijou & Sturges (1959) and by Bijou & Oblinger (1960). Experiments aimed at developing a scale of tangible rewards have been done by Clifford (1959) and by Witryol & Fischer (1960). The latter study measured incentive preferences which reflected the relative rewarding strengths of these incentives.

A number of studies have sought to investigate the effectiveness of a particular social reward such as approval, praise, or statements about the correctness of a response. Of direct interest to this project are the studies of Douvan (1956), Terrell, Durken, & Weisley (1959), Zigler (1962) and Zigler & Kanzer (1962). The Douvan and the Zigler studies showed that verbal reward is more effective with children of middle-class backgrounds than with children of lower-class backgrounds, and the Terrell et al study showed "intangible" rewards to be less effective with lower-class children. The Zigler & Kanzer study also indicated that praise was

1. The term reward is used here in place of the technical term positive reinforcement. For all practical purposes the terms are synonomous.

more effective with lower-class children than were statements indicating the correctness of response. The middle-class children's learning was more influenced by statements about correct responses than by praise. Zigler & Kanzer explained their findings by suggesting that the lower-class child is developmentally less advanced than the middle-class child of the same chronological age. In line with the Zigler & Kanzer interpretation, Lewis, Wall & Aronfreed (1963) have shown that the rewarding value of externally administered social approval decreases with age, and the intrinsic reward which accompanies being correct increases with age. Lewis et al studied first and sixth grade children; the children in the Zigler & Kanzer study included children from 7-2 to 8-7 years of age. McCullers & Stevenson (1960) also found that older children (CA 8-0 to 9-11) were less dependent on praise reward than were young children (CA 3-0 to 4-11). However, Terrell et al did not find consistent age trends in incentive-reinforcement values of stimuli from preschool through elementary school.

Regarding the question of individual differences, Marlowe (1962) working with college students found a relationship between the strength in the need for social approval (measured by the Marlowe-Crowne Social Desirability Scale) and conditionability. In another study Marlowe et al (1964) found a vicarious-reward conditioning effect in students with a high need for approval. The vicarious reward consisted of the students watching a confederate being rewarded with social approval. Cairns (1961) and Cairns & Lewis (1962) reported that children with strong dependency behavior are very influenced by social rewards. Gilmore & Zigler investigated birth order and social reward, and on the basis of their findings concluded that first-born children showed less need for social reward than later-borns when social reward was more readily available. They attributed this finding to satiation effects in the first-born children.

The studies dealing with variables which influence the effectiveness of rewards may be divided into two classes. One class includes studies which consider the characteristics of the dispenser of the rewards and the second class includes studies involving such conditions as the deprivation and satiation of reward.

Most of the studies dealing with the characteristics of the dispenser of reward have been done by Stevenson and his co-workers. These studies, Stevenson (1961), Stevenson & Allen (1964), and Hill & Stevenson (1965), indicate that there is a consistent tendency for children to perform better under a social reward condition when they are rewarded by an experimenter of the opposite sex and to perform better for an experimenter of the same sex under a nonreward condition. Epstein & Liverant (1963) found that "high masculine identifiers" among 5 to 7 year-old boys were conditioned better by a male experimenter than by a female experimenter. Stevenson, Keen, & Knights (1963) found strangers to be more effective rewarders for pre-school children than were their parents. Other studies (Gewirtz & Baer, 1958 and Stevenson & Knights, 1962) have shown that familiarity with a rewarding adult reduces the effectiveness of the adult as a social rewarder. Stevenson interprets these findings in terms of satiation effects; he suggests that the children in these situations may have been partially satiated for rewards from parents or

familiar adults. This interpretation is similar to Zigler's with respect to first-born children, and it receives the benefit of indirect support from a study by Crandall, Good, & Crandall (1964) who found that children tend to be more sensitive to adult reactions when the adult reactions are different from those they generally experience.

The first of the studies dealing with deprivation and satiation of social rewards was done by Gewirtz & Baer (1958) who found that a minimal amount of social isolation enhanced the effectiveness of an approval reward and that the effectiveness of approval reward was reduced if rewards of that type have been freely dispensed earlier. Their results are supported by a study of Stevenson & Odom (1962), but a later study by Hill & Stevenson (1964) indicated that the effects of social isolation were related more to sensory deprivation than to social isolation per se. Hill & Stevenson also reported that isolation has differential effects as a function of the age and the sex of the children studied; boys were more affected by isolation in an empty room than were girls, and younger (5-year olds) children were more affected by nondeprivation conditions. According to Hill & Stevenson the nondeprivation conditions might have had a satiation effect on these younger children. The effects of social isolation are apparently complex as is indicated by data from Lewis (1965) who found that relatively long and relatively short periods of social isolation produce greater effects than do periods of intermediate length. A series of studies by Walters and his associates (Walters, Marshall & Shooter 1960; Walters & Ray, 1960; Walters, 1962) have shown that the effectiveness of social isolation is enhanced by increases in emotional activity. Stevenson & Hill (1964) also interpret their data in terms of anxiety. They suggest anxiety may lessen the effects of social reinforcement and increase the effects of nonreward.

There have been very few studies dealing directly with conditioning rewards. Patterson (1965a, 1965b) reports data indicating that children become more responsive to social rewards as a result of therapeutic sessions in which therapists paired such rewards as candy and money with social approval rewards. Evidently the pairing of strong secondary rewards or primary rewards with the relatively weak social approval reward had the effect of establishing the reward value of social approval. This result would be expected from the principle of conditioned reward, but Patterson's data are among the first to support these expectations in research with humans. Fort (1965) found that neutral stimuli become conditioned rewards when they have been paired with primary rewards. Her subjects were preschool children. Bandura (1962) has reported a series of experiments showing how conditioned rewards may acquire their reinforcement power vicariously. One procedure cited by Bandura involves having the subject observe a model getting rewarded. Staats & Staats (1963) while not reporting any data, do describe some mechanisms that may play a part in establishing reward. They cite direct experience, that is, direct pairing of the sort described by Patterson; and they cite language experience which is essentially pairing by means of symbols rather than by direct experience.

The studies cited above call attention to the complex interactions among types of rewards, individual differences, and situational variables which influence reward effectiveness. None of the relationships is clearly established, but there is some evidence for the following tentative

conclusions: (1) the effectiveness of tangible rewards is related to their incentive-preference value. (2) The effectiveness of social-approval rewards is influenced by such factors as the social-approval motivation of the learner including, of course, the effects of social-approval deprivation or satiation; his socio-economic class; his level of maturity; and his level of emotional arousal, with this latter condition being possibly related to deprivation of approval. (3) The effectiveness of social rewards is influenced by certain characteristics of the dispenser of the reward. His sex and his familiarity to the learner appear to be important characteristics.

Objectives.

This research makes use of a model representing the conditioning of reward effectiveness in terms of a hierachical order. The assumption is made that the effectiveness of many tangible rewards (small toys, trinkets, candies etc.) is well established in children five years of age and older and that social rewards obtain their reward effectiveness by having been paired with approval in its various forms. Furthermore, it is assumed that the reward effectiveness of statements confirming correct responses, for example, "That's right" or "Correct" is obtained by associating such statements with approval and that the ability to use self reward is learned by having this form of behavior rewarded by external approval. In short, the model used here represents the development of self reward as dependent upon confirmation of correct responses; the development of confirmation of correct responses as dependant upon approval and the development of approval reward dependant upon tangible rewards.

Three hypotheses were tested in Experiment 1 and a fourth hypothesis, derived from the results of Experiment 1 was tested in an additonal study, Experiment 2. Experiment 2 is described later in the report.

The hypotheses for Experiment 1 are as follows:

I a) Tangible rewards are more effective with children five to six years of age than are approval rewards.

b) Approval rewards ("good", "That's fine", etc.) are more effective with children five to six years of age than are statements confirming correct responses (That's correct," "That's right," etc.)

II a) With children for whom social approval is a neutral stimulus, that is, not rewarding, it can be conditioned to become a reward stimulus (a reinforcer) by pairing it with tangible rewards.

b) With children for whom the confirmation of correct responses is not an effective stimulus (not reinforcing) it can be made effective by pairing it with social approval, providing the social approval is itself an effective reward.

c) Self-reward, the ability to make such statements as--"I am correct....I have done a good job." and be rewarded by these self-initiated statements is based on a previous reward history in which

tangible rewards, approval, and statements confirming correct responses have been associated with self-initiated reward.

III Conditions which influence the strength of a reward will effect the power of that reinforcer to condition other rewards. For example, depriving the learner of a particular reward will increase the effectiveness of that particular reward when it is used again. When a neutral (nonrewarding) event or weakly rewarding event is paired with the previously deprived reward, the neutral or weakly rewarding event will acquire strong rewarding powers more readily than when paired with a nondeprived reward.

Method

The study was carried out in three overlapping phases. One phase involved classifying the reward responsiveness of the children who participated in the research; a second phase involved the establishing of new rewards; and a third phase was a testing phase.

The classification phase entailed a comparison of the three types of rewards in order to determine their effectiveness for particular children. The studies in this phase were designed to identify three types of reward-responsiveness. One type included the children who were more responsive to tangible rewards than to social-approval rewards. These children are referred to for identification purposes as Tangibles. A second type includes the children who are responsive to social approval, but who are not responsive to being told they are "correct." These children are referred to as Approvals. The third type includes the children who show a high level of responsiveness to verbal statements indicating they have made correct responses. These children are referred to as Corrects. The selection procedures are based on the model referred to above.

The first set of comparisons was designed to identify the Tangibles and the Approvals. A total of 212 kindergarten children participated in this session.[2] Of these, the data, for 12 children was discarded because of equipment failure or an excessive lack of cooperation by a child.

In the first session each child participated in two simple operant conditioning tasks. One task was a lever-pulling (LP) game in which the child learns to pull one of two levers with each lever activating an auditory signal (bells of different pitch). The other game was a version of the Marble-in-the-Hole Game (MH) as modified by Patterson (1965). This game is a two-choice task in which the child places a marble in one of two holes in a large wooden box containing a chute to return the marble. The apparatus was modified for this study by arranging to have the marble activate the ringing of a bell as it descends the chute. These various auditory signals were used simply to add interest

2. The children for Experiment 1 were enrolled in the Cherry Lane School, Carle Place Schools, Carle Place, New York. The experiment was conducted in a room set aside for that purpose.

to the games. For one half the children the LP game was played first, and for the other half the MH game was played first. Each of the children played each game under different reward conditions. For one game the children were given tangible reinforcers which they had preselected from a collection of five tangible items including small toys, trinkets, and candy. For the other game, approval reward was given. The approval condition was always presented first.[3] In playing each game the child stood before a 24-inch high table on which was fixed an 8 inch diameter toy plastic steering wheel. He was instructed to hold on to the wheel between trials.

Prior to playing the experimental games, each child participated in a brief acclimating task consisting of two telegraph keys each of which activated a buzzing sound. This game was used to familiarize the child with the general procedure, to avoid alternation patterns of responses in which the first response is left, the second right, the third left, the fourth right etc., and to make the child comfortable in the experimental situation. The instructions given to the child are presented in Appendix A.

Following the telegraph-key game the child was introduced to the first experimental game, marble-in-the-hole or lever-pulling. The game began with a 15-trial baseline period (Instructions to child are given in Appendix A) followed by two blocks of 15 conditioning trials and then a block of 15 extinction trials. The onset of a trial was signalled by a buzzer. The inter-trial intervals varied from 7 to 15 seconds with the interval controlled by a motor driven cam timer. The response to be conditioned was the response that occurred the least number of times in the baseline period. The conditioning consisted of the experimenter (E1)[4] saying "good" or "fine" or "That's very good." each time the appropriate response was made. Following the 30 conditioning trials the 15 extinction trials were given during which E1 said nothing.

The second game made use of tangible rewards. The general procedure was similar to that used in the first game. The major difference was that each time the child made the appropriate response during the conditioning trials a tangible reward was delivered by means of a Gerbrands Universal Feeder, Model 35.[5] The child was instructed to place each of his rewards in a paper bag attached to the table on which the feeder sat. (Full instructions are shown in Appendix A.) The bag of tangibles was given to him at the end of the session. The tangibles were delivered impersonally; E 1 controlled the feeder by means of a button attached to her clipboard. The arrangement of wires and equipment was such that a child saw no relationship between E 1's actions and the presentation of the tangibles. For all practical purposes, the tangibles were controlled by the child's responses. At the end of the session the child was asked which game he liked best.

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3. Approval was given first so as to avoid any conditioning effect.

4. Two different female experimenters conducted this research.

5. The tangible rewards were small toys, jewelry and trinkets purchased from Paul A. Price Co., Rosylyn, N. Y.

Children were classified as Tangibles or Approvals in terms of the extent to which they responded to either reward in the first session. To be classified as a Tangible, a child had to make at least 3 more conditioned responses during the second blocks of conditioning trials than he did during the baseline block of trials, and make at least 4 conditioned responses in the last 5 conditioning trials. The same criteria applied for the Approvals classification.

From two to three weeks following the first session, the 55 children who were classified as Approvals participated individually in a second session. The second session conducted by E 2 was designed to determine responsiveness to confirmation of correct responses.

The same general procedure used in the first session was applied in the second session, but the two games were different. One of the games for the second session was a dial-turning game (DT) in which the child learned to turn one of two large discriminably different dials. As either dial was turned the loudness of an auditory signal was increased, but not beyond the comfort range. The other game was a plunger pushing and pulling game (PP). The child learned to push in and pull out one of two discriminably different plungers. Both plungers, when activated, produce the sound of door chimes.

The two reinforcing conditions in the second session were social approval and confirmation of correctness. The social approval statements were "Good!" or "That's fine!" or "You're doing very well!" delivered in random order. The statements confirming correct responses were "That's right." or "you are correct." or "Right." also delivered in random order.

The order of reinforcement and type of game was counterbalanced such that there were four groups as follows: (1) DT game with approval reinforcer, then PP game "correct" reinforcer; (2) DT game with "correct" reinforcer, then PP game with approval reinforcer; (3) PP game with approval reinforcer, then DT game with "correct" reinforcer; (4) PP game with "correct" reinforcer, then DT game with approval reinforcer.

In the second session 36 Tangibles were also studied to determine whether or not these children could meet the criterion for classification as Corrects.

The second phase of Experiment 1 was designed to condition reward effectiveness. The purpose was to establish rewarding functions for the non-rewarding events identified in the first and second sessions.

To condition responsiveness to approval reward in children who were not found to be responsive to approval but who were responsive to tangible rewards, social approval was systematically paired with tangible rewards. To examine the effects of such pairing, four groups of 10 children each were studied with each child in the group participating individually. One group involved social pairing of approval and tangible in which the experimenter (E 1) handed the tangible reward to the child immediately after making an approving statement. A second group involved a nonsocial pairing condition in which E 1 made an approving statement and the tangible reward was delivered by means of the feeder.

A third group was exposed to a 10-minute period of deprivation of tangible rewards and was then conditioned in the social pairing fashion. The deprivation was accomplished by showing a child a box containing 5 different, new tangible rewards and asking him to say which one he liked best. He was encouraged to handle and to examine the items. Following 2 to 3 minutes of this experience, the box was closed, locked and removed from the child's view with no explanation given. In fact, E 1 said nothing as this was done. The child was then given a 10-minute time-filling task of coloring pictures. Following the 10-minute period, the child was introduced to the conditioning situation.

A fourth group of 10 children served as a control group. The children in this group played the games and were given tangible rewards delivered by the feeder, but no approval pairing was done.

Two games were used in this approval conditioning session. The first game was a footpedal game in which the child learned to press one of two pedals; the right-side pedal turned on a red light on the child's left and the left-side pedal turned on a blue light on the child's right. All children were given 10 baseline trials followed by 15 conditioning trials during which the pairing was done. During the conditioning trials, the control children were given tangible rewards. The second game was the preferred game from session 1 (lever-pulling or marble-in-the-hole), and the children were given 20 conditioning trials on the second game.

The effectiveness of the conditioning was tested one week to 10 days after the conditioning session. E 2 conducted the testing. The test involved two discrimination games. One game required the child to learn to press one of two toggle switches when a light is on and the other when the light is off. Each of the switches produced the ring of a bell, but the activation of one particular switch was rewarded when the light was on, and the other switch was rewarded when the light was off. The other game was also a discrimination game referred to as the stylus in the hole game. The child was taught to place a stylus in one of two holes when a card with an X on it was displayed and in the other hole when a blank card was displayed. The stylus in either hole activated a series of clicking sounds. One of the games was played under social-approval conditions and the other under tangible-reward conditions. The order of the games was counterbalanced.

A pairing procedure was used to condition responsiveness to confirmation of correct responses in the children who were classified as Approvals but who did not qualify as Corrects. In this phase of the experiment there were two experimental groups and a control group.

One experimental group consisted of 9 children each of whom was deprived of approval for 20 minutes. The deprivation consisted of leaving the child alone in the experimental room prior to beginning the conditioning. The child was told by E 1, "I'm going to leave you alone for a few minutes. While I am gone you may color in this book or you may draw pictures on this pad." E 1 then left and returned 20 minutes later. She remained in earshot of the room in the event the child cried or left the room. No child did so.

A second experimental group of 9 children was not deprived. Both groups were treated indentically during conditioning. They were given 10 baseline trials and 20 conditioning trials with the FP game and then went on to 20 more conditioning trials with the preferred game from the first session. The conditioning consisted of E 1 pairing statements confirming the correct response with approval statements. A typical pairing would be -- "That's right....Very good" or "Correct....That's excellent."

The control group of 8 children was conditioned to make a particular response in each game with approval as the reward, but no statements confirming correct responses were made.

One to 10 days following conditioning the children in each of the three groups were tested by E 2. The same procedures used to test the conditioned Tangibles was used to test the conditioned Approvals.

The attempt to establish self reward skills involved pairing of approval with self-initiated statements identifying correct responses. Ten children who were originally classified as Corrects and 10 originally classified as Tangibles were conditioned. Two games were used, toggle switch and stylus-in-the-hole. For the toggle-switch game, E 1 confirmed the first 8 correct responses and then instructed the child to say when he thought he was correct. (Specific instructions to the child are shown in Appendix A.) When the child made a correct response and identified it appropriately, E 1 initially rewarded him by saying, "That's right. Good...you can decide yourself when you are correct" or "Correct. You are doing very well. Keep up the good work." After 5 or 6 such rewards by E 1 she switched to such statements as: "Fine" or "Excellent" or "Nicely done." When the child was incorrect in his identification, E 1 said, "That was not correct. Let's try the next one." or "That wasn't right. Let's do the next one." This procedure continued for a total of 20 correct identification trials but not exceeding an overall total of 60 trials.

Following the toggle-switch game, the child went on to the stylus-in-the-hole game for a total of 20 correct identifications or an overall total of 40 trials.

A control group of 10 Corrects learned the two discrimination games while being rewarded with confirmation of correct responses. These children were given no specific self-reward training.

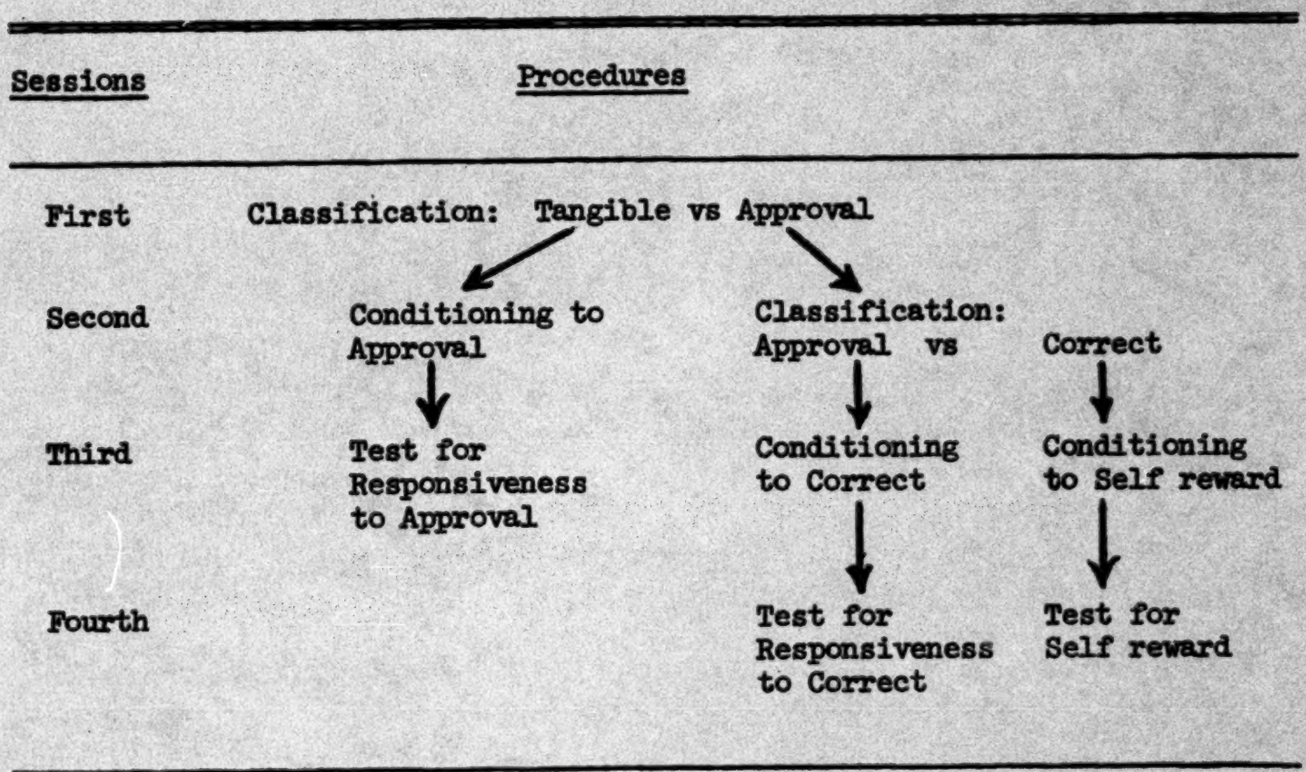
Each of the children in the two Corrects groups was given three sub-tests of the Revised Stanford-Binet Scale (Terman and Merrill, 1960): Pictorial Similarities and Differences, Patience: Rectangles and Mutilated Pictures.

The determination of the effectiveness of self-reinforcement training was made by assessing performance on a self-instructional lesson in the fourth session conducted by E 2. The self-instructional lesson was a programmed unit the purpose of which was to teach the child to match letters and letter combinations up to five-letter words. The lesson began with pictures, went on to geometric designs and then on to letters, letter combinations and words. Two sample pages of the lesson correctly marked by a child are shown in Appendix B and the letter sequences are shown in their entirity.

Table 1 outlines the procedural sequences. Presented there is the classification, conditioning and test sequences for all groups in Experiment 1.

Table 1

Classification, Conditioning and Test Sequences in Experiment 1.



Results

Of the 200 children who participated in the first session of Experiment 1, 106 (53 percent) qualified for classification as Tangibles; 55 (27 percent) qualified for classification as Approvals; and of the 55 Approvals, 28 (50 percent) qualified for classification as Corrects. Approximately 20 percent did not qualify for any classification group in the first session. Thirty two of these unclassifiable children were run again in a special second session at which time 24 of the 32 (75 percent) were classifiable as Tangibles of whom 5 were Approvals. Thus, the data from the first session and the special second session indicates that in terms of the criterion used here 60 percent of the children qualify as Tangibles, 30 percent as Approvals of whom 50 percent are also Corrects, and 10 percent do not qualify for any of the groups.

To determine the relative effectiveness of the tangible rewards, approval rewards and confirmation of correct responses, conditioning scores were obtained for each child. These scores were calculated by subtracting each child's baseline score (the number of relevant responses made during the baseline period) from the number of conditioned responses made during the last 15 conditioning trials. Thus, if a child in the marble-in-the hole game under approval reward conditions made 12 conditioned responses to the left-side hole (that hole being the one rewarded) and had made 5 left-side hole responses during the baseline period, his conditioning score would be 7.

The median conditioning score for the tangible reward condition was 6 and for the approval reward condition was 2. Twenty seven children had minus or zero scores under the tangible reward condition and 58 children had zero or minus scores under approval reward. One hundred thirty nine of the 200 children showed higher tangible-reward conditioning scores than approval-reward scores and only 54 children showed higher approval scores than tangible scores. A sign test on these data indicated the difference between the tangible-reward scores and the approval-reward scores was significant at the .01 level of confidence (χ^2 = 15.80, 1 df). The Pearson-product moment correlation between the approval-reward conditioning scores and the tangible-reward conditioning scores was .06, indicating no relationship between the two.

In the second session, the 55 Approvals and 36 of the Tangibles were studied to determine their responsiveness to confirmation of correct responses ("Correct," "That's right" etc.) Table 2 shows the classification of children in the second session as it relates to the classification in the first session. This table reveals that approximately 50 percent of the Approvals qualify as Corrects in the second session while only 25 percent of the Tangibles qualify as Corrects. Furthermore the Tangibles classification is more stable: 3 of the 36 Tangibles do not requalify as Tangibles, and 16 of the 55 Approvals do not requalify as Approvals. The differences between Tangibles and Approvals insofar as their qualification to be classified as Corrects and their qualification to be reclassified in the second session as they were in the first session is significant at the .01 level of confidence. (χ^2 = 20.46, 2 df)

Table 2. Classification of Ss in Second Session

Classification in Second Session	Classification in First Session: Tangibles	Classification in First Session: Approvals
Same as Session I	24	11
Corrects	9	28
Unclassified	3	16

Note: Session II entails tangible reinforcement vs "correct" as a reinforcer for Ss classified as Tangibles and approval vs "correct" for Ss classified as Approvals.

For the 55 Approvals, the median approval score in the second session was 3 and the "correct" score was 4. Twenty one children showed higher "correct" and 22 children higher approval scores. This difference is obviously not significant. The Pearson product-moment correlation between "correct" and approval reward was .67 indicating there is a high degree of relationship between them. The two scores cannot be regarded as independent.

The data for the tangible-reward and approval-reward comparisons for the first and second sessions indicate that tangible rewards are generally more effective. The data for the approval-reward and "correct"-reward comparisons do not support the hypothesis that approval is more effective than "correct." The two appear to have the same general effect.

Thirty-two of children who were found to be unclassifiable in the first session participated in a special second session in which the plunger-pushing and dial-turning games were used. Sixteen of the children were conditioned after having been deprived of tangible rewards in the same manner described above for the Tangibles who were conditioned to Approval, and sixteen were conditioned without deprivation.

The results of the special session are shown in Tables 3 and 4. Table 3 indicates that a substantial majority of the originally unclassifiable children were classifiable as Tangibles in the second session. Twenty four (75 percent) qualified as Tangibles of whom 5 were also classifiable as Approvals.

Table 3. Classification on Retest of 32 Ss Originally Unclassified in Session I

	Approval	Tangible
Qualify	5	24
Not Qualify	27	8

$\chi^2 = 22.86$

Table 4.

Means and SDs of First and Second Session Conditioning Scores of Children Unclassifiable in First Session

		First Session		Second Session	
		A	B	A-deprived	B-nondeprived
Approval	Mean	1.63	.06	1.88	.44
	SD	1.76	2.07	3.10	3.02
Tangible	Mean	2.63	2.06	5.63	5.81
	SD	3.18	3.21	4.10	3.81

The analysis of variance for the data in Table 4 (Table I, Appendix C) and a series of t tests show that the tangible-reward conditioning scores in the special second session were significantly higher than they were in the first session ($t = 3.67$, df 31) and were significantly higher than the approval scores in the second session ($t = 5.02$, df 31). The tangible scores in the first session were also significantly higher than the approval scores in the first session ($t = 2.19$, df 31). The deprivation condition appeared to have no significant effect.

The retested children are, for the most part, Tangibles and this lends further support that tangible rewards are more effective than approval rewards with children in the five to six-year age range.

The effects of conditioning the Tangibles to become responsive to approval rewards were examined in terms of an analysis of the discrimination-learning scores in the third session for each condition of the second session. The discrimination-learning scores consisted of the number of trials required to reach a criterion of 4 successive correct responses. The means and SDs of these scores for the three conditioning groups and the control group are presented in Table 5. The extinction score means and SDs are presented in Table 6. The extinction scores consist of the number of conditioned responses made during the 15 extinction trials.

Table 5

Trials to Criterion of Tangibles as a Function of Conditioning to Approval

Reward		Conditioning group			
		Deprivation	Social Pairing	Non-Social Pairing	Control
Approval	Mean	24.40	21.40	18.50	26.2
	SD	20.30	15.64	9.64	20.30
Tangible	Mean	30.10	26.20	26.40	36.20
	SD	18.86	17.92	16.87	21.86

Table 6

Extinction Scores of Tangibles as a Function of Conditioning to Approval

Reward		Conditioning group			
		Deprivation	Social Pairing	Non Social Pairing	Control
Approval	Mean	6.10	4.70	4.90	5.30
	SD	1.64	2.15	2.07	1.01
Tangible	Mean	4.60	4.10	4.60	5.00
	SD	1.96	1.30	2.25	1.55

The cell variance of the learning scores were not homogeneous. A $\sqrt{x + 1}$ transformation was performed before doing an analysis of variance of the learning data. The analyses of variance for both learning and extinction (Tables II & III, Appendix C) show no statistically significant effects. There is no support for the hypothesis that any of the pairing conditions was superior to the Control group. The Control group appears to be as responsive to approval as the groups specifically conditioned to be responsive.

The effects of conditioning Approvals to become responsive to confirmation of correct responses was examined in terms of an analysis of the discrimination learning scores in the fourth session for each pairing condition in the third session. The means and SDs of the learning scores for the two conditioned groups and the control group are presented in Table 7 and the extinction means and SDs are presented in Table 8.

A $\sqrt{x + 1}$ transformation was performed for the analysis of variance of the learning scores. This analysis (Table IV, Appendix C) indicates no statistically significant effects. The analysis of variance of the extinction data (Table V, Appendix C, shows a significant interaction effect at the .05 level ($F = 4.12$, 2 and 22 df.)

Table 7

Trials to Criterion of Approvals as a Function of Conditioning to Correct

Reinforcement		Conditioning		
		Deprived	Non Deprived	Control
Correct	Mean	18.56	19.67	11.43
	SD	17.65	15.83	6.48
Approval	Mean	29.81	24.89	30.86
	SD	25.95	13.15	26.07

Table 8

Extinction Scores of Approvals as a Function of Conditioning to Correct

Reinforcement		Conditioning		
		Deprived	Non Deprived	Control
Correct	Mean	4.67	5.33	5.71
	SD	1.05	1.28	1.16
Approval	Mean	6.33	5.22	5.14
	SD	1.41	1.87	1.81

This effect is seen in Table 8 where the deprived group extinguishes more rapidly to "Correct" and the Control group extinguishes more slowly to "Correct". The effect, although statistically significant, is very small.

There is no support in these data for the hypothesis that pairing approval and "correct" in either a deprivation condition or a non-deprivation condition was superior to a control group in which no pairing had been done. There were no significant conditioning effects and the interaction effect observed does not support the hypothesis.

The effects of conditioning the Corrects and a group of Tangibles to use self reward was studied by analyzing the scores these children obtained in the 30-item self instructional lesson. Each score consists of the number of correct matching responses. The means and SDs for these scores are presented in Table 9. The analysis of variance of these data (Table VI, Appendix C) show no significant effects. All groups managed the self instructional lesson equally well.

The means and SDs of the Stanford-Binet Scale subtest scores of the experimental and control Corrects groups are presented in Table 10. This table reveals no differences between the two groups.

Table 9

Means and SDs of Self-Instruction Scores

	Corrects		
	Conditioned	Control	Conditioned Tangibles
Mean	26.20	28.10	28.10
SD	3.25	2.21	1.58

Table 10

Stanford-Binet Subtest Scores of Corrects

		Pictorial Similarities	Patience: Rectangles	Mutilated Pictures
Experimental	Mean	9.50	2.30	4.50
	SD	.92	1.00	.67
Control	Mean	10.00	2.00	4.70
	SD	0.00	1.26	.46

In summary, the results of Experiment 1 shows:

a) Tangible rewards are more effective for children in the five to six-year age group than are approval rewards.

b) Approval rewards and confirmation of correct responses are equally effective and have enough in common to be regarded as the same class of events.

c) The conditioning procedures involving Tangibles conditioned to be responsive to Approval, Approvals being conditioned to be responsive to confirmation of correct responses, and Corrects being conditioned to use self reward were not more effective than the control-group procedures in which no systematic conditioning was done.

d) Of the sample of children who participated in the experiment, 60 percent qualified, in terms of the criteria used here, as Tangibles, 30 percent as Approvals of whom at least 50 percent were also Corrects and 10 percent did not qualify for any of the three groups.

Experiment 2

Introduction

The apparent failure to demonstrate specific conditioning effects in Experiment 1 may have been due to the use of insensitive dependent variables and/or ineffective conditioning procedures.

In order to give further consideration to the question of conditioning rewards, a second experiment was performed in which a neutral, nonsense word was used as the stimulus to be conditioned and a systematic effort was made to make the conditional stimulus a salient one.

Words designating approval, such as "good" or "excellent" are often bland or even meaningless having lost their impact by having been used too frequently in trivial or insignificant ways. They suffer from a kind of adaptation effect losing salience and hence losing the property of being conditionable. A stimulus that does not evoke attention is difficult or even impossible to condition as a reward stimulus.

The procedure adopted for Experiment 2 made use of the thesis espoused by Schoenfeld, Antonitis and Bersh (1950), Dinsmoor (1952), and discussed at length by Zimmerman (1957) and Kelleher and Gollub (1962). This thesis focuses on the proposition that a stimulus may become a conditioned reinforcer (reward) if it has first served as a discriminative stimulus (S^D). A stronger way to state this is, "A stimulus will be effective as a conditioned reinforcer for new behavior if and only if it has some response conditioned to it" (Zimmerman, 1957). A stimulus that does not set the occasion for some response will not become a conditioned reward.

Another procedure used in Experiment 2 involved the use of a brief period of reward deprivation during the conditioning process. This deprivation period was introduced in order to make the relationship between the neutral stimulus and the reward stimulus more salient.

Objectives. -- The purpose of Experiment 2 was to determine whether a neutral stimulus such as the nonsense word MAYGLEEN or DEXIDE could be conditioned to serve as a reward stimulus for five and six-year-old children. A further purpose was to determine if the conditioning of a reward requires that the stimulus to be conditioned be a discriminative stimulus (S^D) and whether deprivation of reward during the process of conditioning has an effect upon conditioning.

Method

Ninety seven kindergarten children from P.S. 26, New York City Public Schools participated in the experiment proper. A total of 137 children were seen; 40 were used in pilot studies to refine procedural details and 7 of the 97 used in the experiment did not complete two sessions and their data were discarded.

The children were randomly assigned to one of four groups for the first session. The groups were as follows: A. Discrimination stimulus (S^D) conditioning and deprivation of reward (40 children), B. S^D conditioning and no reward deprivation (20 children), C. No S^D conditioning and deprivation of rewards (20 children), and D. Control group in which one word was conditioned and another word tested (10 children).

The apparatus and materials consisted of five games. Three games, telegraph key, stylus-in-the hole and marble-in-the hole were used in the first session; and plunger-pushing and toggle-switch in the second session. The games sat on a table 24 inches high on which was fixed a window shade and frame such that the experimenter could raise and lower the shade, displaying or hiding from view the game or games in question.

The procedure for group A was as follows: The child was acclimated to the instructions by the telegraph-key game (Instructions to the child are shown in Appendix A.) for 15 trials and then he proceeded to the stylus-in-the-hole game where conditioning began. During conditioning E 1 instructed the child to move the stylus ("pointer") from one hole to the other as fast as he could and to begin the moment the shade was raised. The child was told that when E said "MAYGLEEN" he was to press the button (mounted on a block on the table) in front of him and that by pressing the button he would get a reward. The rewards were tangibles delivered by means of the Gerbrands feeder. For ten of the children, the word was "DEXIDE." The child was given 30 trials; during the first 10 trials every response was followed by "MAYGLEEN" (or "DEXIDE") which set the occasion for pressing the button and getting a tangible reward. During the second 10 trials, six trials were followed by "MAYGLEEN" the button pressing and a tangible reward and four trials were followed by "JAHRIK" or "POOLEFF" two other neutral, nonsense words that did not permit button pressing. During the last 10 trials there were five "MAYGLEEN" trials, three "JAHRIK" trials and two "POOLEFF" trials. Stimuli such as the latter two are usually referred to as S^Δ in contrast to "MAYGLEEN" the S^D. The S^D sets the occasion for a rewarded response an S^Δ does not.[6] The schedule of "MAYGLEEN", "JAHRIK" and "POOLEFF" for the 30 trials was as follows: M M M M M M M M M M J M M P M P M M M J P M M J P M J J M M.

Following the 30 conditioning trials, a deprivation and test sequence were introduced. In this sequence E 1 attempted to condition the child to make one of two responses in the marble-in-the-hole game. A total of 20 trials was used, five warm-up trials and 15 conditioning trials during which E 1 rewarded a particular response (the response made on the sixth trial) by saying "MAYGLEEN" (or "DEXIDE" for the children who had been conditioned to that word). During this test sequence, no tangible rewards were given and the button was not present. After the 20th trial, E 1 told the child he would again be getting rewards from the feeder. The tangible rewards were paired with E 1's saying "MAYGLEEN" (or "DEXIDE"); no button pressing was involved. Fifteen such trials were given according to the following schedule: M M M M M J M M P M P J M M M.

6. In teaching a child to discriminate a b from a d, b is an S^D for his saying "bee" and d is an S^D for his saying "bee".

A second session took place one day later. In the second session an attempt was made to condition the children to play one of two games, the plunger-pushing game or the toggle-switch game. The latter game differed from the one in Experiment 1 in that it did not entail any discrimination learning; the child played by simply pressing one of the two toggle switches. The two games were side by side on the table and the child was told to respond to either one of them each time the shade was raised. Twenty conditioning trials were given during which E 2 rewarded one of the games by saying "MAYGLEEN" and by saying "DEXIDE" for the other game. The game to be rewarded was selected by E 2 in advance and the reward games were counterbalanced. For the children who had been conditioned to "DEXIDE" in the first session, "DEXIDE" was used as the conditioned reward in the second session and "MAYGLEEN" was the neutral stimulus. The prediction in this second session was that the conditioned reward ("MAYGLEEN" or "DEXIDE") should establish a game preference. Thus, if a child had been conditioned to "MAYGLEEN" the game rewarded by this stimulus should be preferred by the child, that is, he should make more responses to this game than to the other game.

Fifteen extinction trials followed the 20 conditioning trials in the second session. During these extinction trials, E 2 said nothing.

For one half of the children in Group A "MAYGLEEN" was the reward stimulus in the second session and the nonreward stimuli were the S^{Δ}s from the first session, "POOLEFF" and "JAHRIK." The prediction for this group, labelled A 1, was that the "MAYGLEEN" game would be preferred over the game rewarded by "POOLEFF" and "JAHRIK," because the latter two stimuli were not directly paired with tangible rewards nor had they been used as S^{D}s. On the contrary, they were S^{Δ}s in that they signalled that no reward would be forthcoming.

The 20 children in Group B were conditioned using the S^{D} procedure. However, during the 15 test trials in the first session they continued to receive tangible rewards paired with E 1 saying "MAYGLEEN" (or "DEXIDE"). No button pressing was involved. The conditioning simply continued with no deprivation of tangible rewards. This is in contrast to Group A who were deprived of tangibles during the 15 test trials. For the Group B children, the second conditioning session followed one day later as it did for Group A.

The 20 children in Group C did not participate in S^{D} conditioning. They began the conditioning with a direct pairing schedule in which "MAYGLEEN" was paired with tangible rewards, but it was never used to set the occasion for a specific response such as pressing a button to obtain a tangible reward. The second session conditioning followed one day later as for Groups A and B.

The 10 children in Group D constituted a control group. These children were given 30 conditioning trials with the S^{D} procedure in which "MAYGLEEN" was the S^{D}. The 20-trial test condition consisted of E 1 saying "DEXIDE", a stimulus to which the children had not previously been exposed. In other words, these control-group children were conditioned to "MAYGLEEN" and tested with "DEXIDE". They did not participate in a second session.

Results

The results of Experiment 2 are presented in three parts: the first session test, the conditioning scores from the second session and the extinction scores from the second session.

Table 11 presents the means and SDs of the conditioning scores from the first session. To determine whether conditioning has occurred in any of the groups, t tests were performed in which each group mean was compared with a hypothetical mean of 7.50. If no conditioning occurred the mean scores should not differ significantly from a chance score, in this case the chance score is represented by 7.50.

Table 12 presents the four t tests. The significance levels are given in terms of Dunnett's tables (Dunnett, 1955) for one-tailed tests involving multiple comparisons of several treatments with a control. The control in this case is the hypothetical mean.

Table 11

Means and SDs of First Session Conditioning Scores

	A S^D procedure	B Tangibles given	C No S^D	D Control
Mean	8.95	9.85	8.05	7.70
SD	2.46	2.71	2.92	2.69

Table 12

t Tests Between Obtained Means and Hypothetical Mean of 7.50

group	t	df	
A) S^D procedure	3.70	39	.01 level
B) Tangibles given	3.78	19	.01 level
C) No S^D procedure	.82	19	--
D) Control	.22	9	--

An examination of Tables 11 and 12 reveals that conditioning occurred in Group A, the group conditioned with the S^D procedure. Group B was given tangible rewards during the marble-in-the-hole conditioning sequence and this group also conditioned, but the conditioning can be attributed to the tangible rewards as well as to the conditioned reward. Group C conditioned without the S^D procedure and group D, the control group, did not show conditioning.

Table 13 presents the means and SDs of the conditioning scores in the second session. These scores were obtained by counting the number of responses made to the game associated with the conditioned reward word and dividing by the number of opportunities the child had to make the rewarded response, then multiplying the result by 100 to eliminate the decimal point. For example, if one child made the response to the to-be-conditioned game on the first trial, he then had 19 more opportunities to make responses to that game. If he proceeded to make 16 such responses his score would be 16/19 x 100 or 84. A child who showed no systematic preference for one game over another would be expected to show a score of 50 and this score was used as the hypothetical mean against which the mean scores of the four groups were compared. These t tests are presented in Table 14.

Table 13

Means and SDs of Second Session Conditioning Scores

	A S^D & Deprivation	A 1 S^D & Deprivation S^Δ in Test	B S^D; No Deprivation	C Deprivation No S^D
Mean	63.75	58.50	55.05	58.25
SD	18.00	13.50	13.54	15.49

Table 14

t Test for Differences between Obtained Means and Hypothetical Mean of 50

Groups	t	df	
A) S^D & depriv.	3.33	19	.01 level
A1) S^D & depriv. S^Δ	2.74	19	.05 level
B) No depriv.	1.63	19	--
C) No S^D	2.32	19	.05 level

Tables 13 and 14 reveal that groups A, A 1 and C show conditioning. Group B, the group not deprived during the conditioning sequence in the first session did not show any conditioning effects in the second session.

The means and SDs of the extinction scores are shown in Table 15 and the t tests comparing the means against the hypothetical mean of 7.50 are shown in Table 16. These tables reveal that Group A (S^D procedure and deprivation) continues to show the effects of the first session conditioning. The children in this group give a significant number of conditioned responses during extinction. This was not the case for groups A 1, B and C. Group A 1 differed from A only in terms of the conditioning in the second session where the S^Δs "POCLEFF" and "JAHRIK" were matched against the conditioned word "MAYGLEEN." Apparently the S^Δs had developed some conditioned reward effect of their own through generalization in the second session and this effect was sufficiently strong to compete with the reward effect of "MAYGLEEN".

Table 15

Means and SDs of Extinction Scores

	A S^D & Deprivation	A 1 S^D & Deprivation S^Δ in Test	B $S;^D$ No Deprivation	C Deprivation No S^D
Mean	9.60	8.70	8.60	7.80
SD	3.18	3.05	2.45	2.91

Table 16

t Tests for Difference between Obtained Means and Hypothetical Mean of 7.50

	Groups	t	df	
A	S^D & deprivation	2.87	19	.01 level
A 1	S^D & Dep; S^Δ	1.71	19	--
B	No deprivation	1.95	19	--
C	No S^D	.45	19	--

Conclusions Based on Experiments 1 and 2

The assumption of a hierarchical order of reward effectiveness appears to be a tenable one at least where tangible and approval rewards are concerned. Tangible rewards are generally more effective than approval rewards and the results of Experiment 2 support the view that tangible rewards can be used to condition reward effectiveness in stimuli that are not now rewarding.

The hierarchical order of approval and confirmation of correct responses was not supported by the results of this research. The children reacted similarly to "correct" and to approval. A child who was responsive to one was usually responsive to the other. It is likely that a generalization effect operates and that both kinds of verbal statements are often perceived as identical. The children probably do not discriminate "That's good" and "That's correct" when they are said by the same person in the same general context. Zigler & Kanzer (1962) did find a difference, but they worked with older children, ages 7.2 - 8.7 with a mean age of 7.7. The children in the research reported here were 5.5 - 6.8 with a median age of 6.0.

A better test of the effects of confirming correct responses might entail the use of impersonal stimuli such as a light that flashes on to indicate a correct response.

The classification of children into Tangibles and Approvals does appear to be reliable. The question arises is it a useful classification? Can predictions be made on the basis of such a classification? To answer this question, albeit tentatively, additional data were obtained for the children who had been studied during the first year of the project. The additional data consisted of scores on the Metropolitan Readiness Test,

Form R (1949) and questionnaire data dealing with the children's performance one year later in the first grade. The Metropolitan Test was administered by the school in the spring of the kindergarten year and the questionnaire (Appendix D) was answered by the children's first-grade teachers in January of the first-grade year.

These additional data indicated that the correlation between scores on the Metropolitan Test and overall performance in school (Total questionnaire score, the scoring is shown in Appendix D) was significant. The Pearson r was .47 (n = 200). The correlations between reward-responsiveness and the Metropolitan were not significant: the r for Metropolitan and approval scores (block 2 minus baseline) was .03 and for Metropolitan and tangible score was -.03.

To determine the possible role of reward responsiveness in school achievement, the children were classified into achievers and underachievers. An underachiever was a child whose school achievement rating fell below his Metropolitan percentile. For example, if a child scored in the 90th percentile in the Metropolitan and his achievement rating was less than "Excellent" or if he scored in the 80th percentile and his achievement rating was less than "Good" or if he scored in the 70th percentile and his achievement rating was less than "Fair", he was designated an underachiever. Achievers were children whose percentile scores and achievement ratings matched or the achievement ratings were higher than the percentiles.[7]

Table 17 shows the distribution of achievers and underachievers in relationship to the highest and lowest approval quartiles. Part A of the table deals with children whose Metropolitan scores were in the 80th percentile or above and Part B with children whose scores were below the 80th percentile. Part A of Table 17 shows a significant difference between achievers and underachievers ($\chi^2 = 6.17$, 1 df). Most achievers (60 percent) are high in approval responsiveness while a very high proportion of underachievers are low in approval responsiveness (75 percent).

The same kind of relationship does not obtain for the children who score below the 80th percentile on the Metropolitan Test. For this sample, all of the achievers are in the lowest approval quartile. A possible speculation is that many of these achievers are probably responding to the negative reward in school (the threat of punishment). Some support for this view is found in the observation that 83 percent of the children in the 80th or above percentile are seen by their teachers as liking school (item I of the questionnaire) while only 37 percent of the children below the 80th percentile are seen by their teachers as liking school. The differences between these percents is significant at the .01 level of confidence.

Table 18 shows the distribution of achievers and underachievers for the tangible quartiles. Part A of this table shows no significant

---

7. The question of overachievers was considered but no significant relationships were observed.

differences between achievers and underachievers although the data do line up similarly to Part A of Table 17. Sixty percent of the achievers are in the highest tangible-responsive quartile and 62 percent of the underachievers are in the lowest quartile. Part B of this table contains insufficient data to warrant any conclusions.

Table 17

Distribution of Achievers and Underachievers into Highest and Lowest Approval Quartile

A. Ss who score in 80th percentile or above on Metropolitan Test

	Quartile	
	Highest	Lowest
Achievers	21	14
Underachievers	5	15

$\chi^2 = 6.17$ (.02 level)

B. Ss who score below 80th percentile on Metropolitan

	Quartile	
	Highest	Lowest
Achievers	3	15
Underachievers	1	0

Table 18

Distribution of Achievers and Underachievers into Highest and Lowest Tangible Quartiles

A. Ss who score in 80th percentile or above on Metropolitan Test

	Quartile	
	Highest	Lowest
Achievers	25	17
Underachievers	8	13

$\chi^2 = 2.50$ (not sig.)

B. Ss who score below 80th percentile on Metropolitan Test

	Quartile	
	Highest	Lowest
Achievers	4	5
Underachievers	1	2

The data from Tables 17 and 18 do suggest that underachievement in the first grade may be related to the lack of approval-reward responsiveness. A significant number of children who obtained high scores on the Metropolitan Test but who were not responsive to approval reward did not achieve up to their test-score standards.

These data are at best suggestive but the suggestion appears to be worth following up. It may lead the way to a more pragmatic and manageable approach to classroom motivation.

Although Experiment 1 did not support the hypotheses about the conditioning of rewards, the results of Experiment 2 did verify the feasibility of conditioning rewards and pointed out effective techniques

for doing so. It was shown that a neutral stimulus can be made to have reward properties by (1) establishing it as a discriminative stimulus so that it sets the occasion for a reward-getting response and (2) arranging the pairing of reward with the stimulus such that there is a period of reward deprivation during which the neutral stimulus stands alone.

Experiment 2 supports Schoenfeld et al (1950) and Dinsmoor (1952) both of whom contend that a stimulus will be effective as a conditioned reward for new behavior if and only if it has been used to set the occasion for a rewarded response.

If one interprets the 15 deprivation-of-tangible-reward conditioning trials as a case of intermittent reward, then support was also found for Zimmerman's position (1957) that intermittent pairing of the unconditioned reward and the neutral stimulus makes the neutral stimulus a more durable conditioned reward.

Another possible interpretation of the deprivation trials may be made in terms of the principle that deprivation increases the effectiveness of a reward thus making the tangible rewards stronger. When the stronger rewards are paired with the neutral stimulus, they lead to more durable conditioning.

A useful conclusion, independent of any interpretation of the data, can be drawn from the results of Experiment 2. The conclusion is that if a conditioned reward is to be established the stimulus to be conditioned should first be a discriminative stimulus or be made into one and then it should be paired with a strong reward stimulus (preferably one for which some deprivation has been in effect) on an intermittent basis. Experiment 1 showed that mere pairing of the two stimuli is not sufficient.

A specific illustration may be seen in the problem of the conditioning of approval words. If such words are not rewarding and we wish to establish them as rewards, we would take the following steps:

(1) Arrange the conditioning situation such that the approval words set the occasion for reward-getting responses while silence or other words does not. For example, the teacher (or experimenter or therapist) might say, "good. You may now pick out a toy to play with." or "Fine you may now go to the shelf and find something you like." Only approval words allow such responses to be made.

(2) If the approval words are to be S^Ds they must be discriminable and attention-capturing stimuli. If the words are not heard or they are ignored they cannot come to serve as S^Ds. In Experiment 2 the to-be-conditioned words, "MAYGLEEN" and "DEXIDE" were novel and their novelty probably played an attention-capturing role, while in Experiment 1 the words, "good" "Fine" etc. may have been too familiar and bland.

(3) Once the approval words are serving as S^Ds, pair them with a variety of reward stimuli. For example, "good" may be paired with

the presentation of candy, desirable objects and/or special privileges.

(4) Gradually introduce more intermittency in the pairing of the approval words and the reward stimuli and work toward long periods of time during which the approval words are presented unaccompanied by other rewards.

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APPENDICES

Appendix A

Instructions used for the first session of Experiment 1

E 1 says -

"When the buzzer sounds (E sounded buzzer) you are to press this like this (E pressed right on left key) and then put your hands on the wheel (E placed hands on the wheel) like this (E repeated buzzer and pressed same key pressed initially 2 more times) or when the buzzer sounds, you may press this one like this (E sounded buzzer and pressed the other key). You may press one more times than the other. I think you're going to press one more times than the other."

S was given ten trials. If an alternation pattern appeared on four consecutive trials, instructions were repeated. The same key was pressed on six consecutive trials, S was told, "You may also press the other one."

LP and MH (all games) were introduced with the same instructions as was the Morse Code sender practice. The same procedures were employed if an alternation pattern or a single response pattern developed during the fifteen baseline trials.

Instructions for the conditioning games, lever pulling or marble-in-the-hole

E says:

"Now we are going to play some games. This is the first (second) game. (Point to game). Each time I sound the buzzer (sound buzzer), you can pull this lever like this (pull one) or you can pull the other lever like this (sound buzzer, pull other lever. Counterbalance over Ss.) Each time you play, you must wait for the buzzer and then pull only one lever. Now let's try it."

(Sound buzzer) "Pull one. Go ahead."
(Sound buzzer) "Pull one. Go ahead."

(For tangible reinforcement):

"While we are playing, sometimes you will get a present. Like this. (Activate feeder. Deliver tangible reinforcer but return it to bucket.) When you get a present, put it in this little bag and save it for later. Now let's start."

(For Approval)

"While we are playing, sometimes I will talk to you. Now let's start."

Appendix A

Instructions used in conditioning self reward

E began with TS game and confirmed with guidance as follows:

"You can learn this game yourself. The game is to find out when to push this one (left) and when to push this one (right). Sometimes this one (left) is correct and sometimes this one (right) is correct. Notice this light! Sometimes the light will be on -- so be sure to watch it. It's better to watch the light because it will tell you which one to push . . . . . .

Now let's begin."

The child was given 10 trials with hints -- e.g. "Now see the light is on so this one was correct" or "The light wasn't on etc. . . . ."

After the 10th trial E said:

"Now you can decide yourself if you are right. Push the switch and say 'RIGHT' when you are correct."

This was done for a total of 15 correct identification trials. During these correct identification trials E provided approval reward for the correct identification responses by saying: "That's very good." or "Very good. You can decide for yourself when you are correct."

Then E went on to the SH game using same procedure except that child is asked to indicate when he was correct after he has made 10 correct responses confirmed by E. Fifteen additional trials were given.

At the end of the session E said, "See you can teach yourself some things. You knew when you were right."

Note - If the child said, at any time, "Not right" or words to that effect, E asked why the response was not right. But no effort was made to encourage the child to identify wrong responses.

Appendix B

The Letter Sequences used in the Self-Instruction Lesson

1)
G
G K

2)
NG
NG NK

3)
SING
SINK SINK

4)
P
F P

5)
PL
FL PL

6)
PLOW
FLOW PLOW

7)
W
W M

8)
Wl
Ml Wl

9)
WILL
WILL MILL

10)
Z
Z S

11)
OZ
OS OZ

12)
DOZE
DOZE DOSE

13)
O
O U

14)
OO
OU OO

15)
POOR
POUR POOR

16)
R
B R

17)
RA
RA BA

18)
RANK
BANK RANK

19)
A
E A

20)
EA
EE EA

21)
BEAT
BEET BEAT

22)
A
A I

23)
AI
IA AI

24)
LAIR
LIAR LAIR

25)
C
C G

26)
CO
CO GO

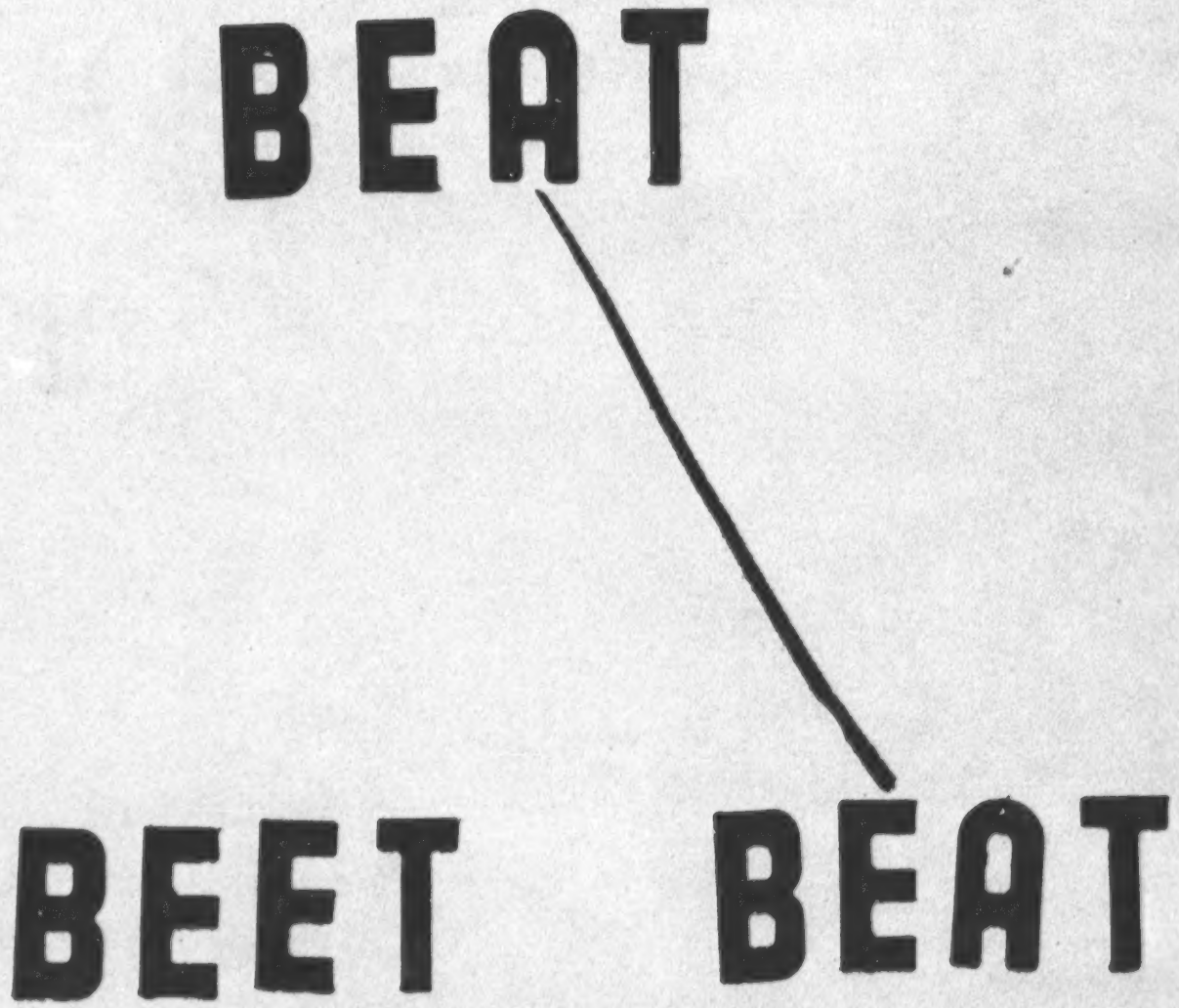
27)
COAT
GOAT COAT

28)
I
U I

29)
lC
lC UC

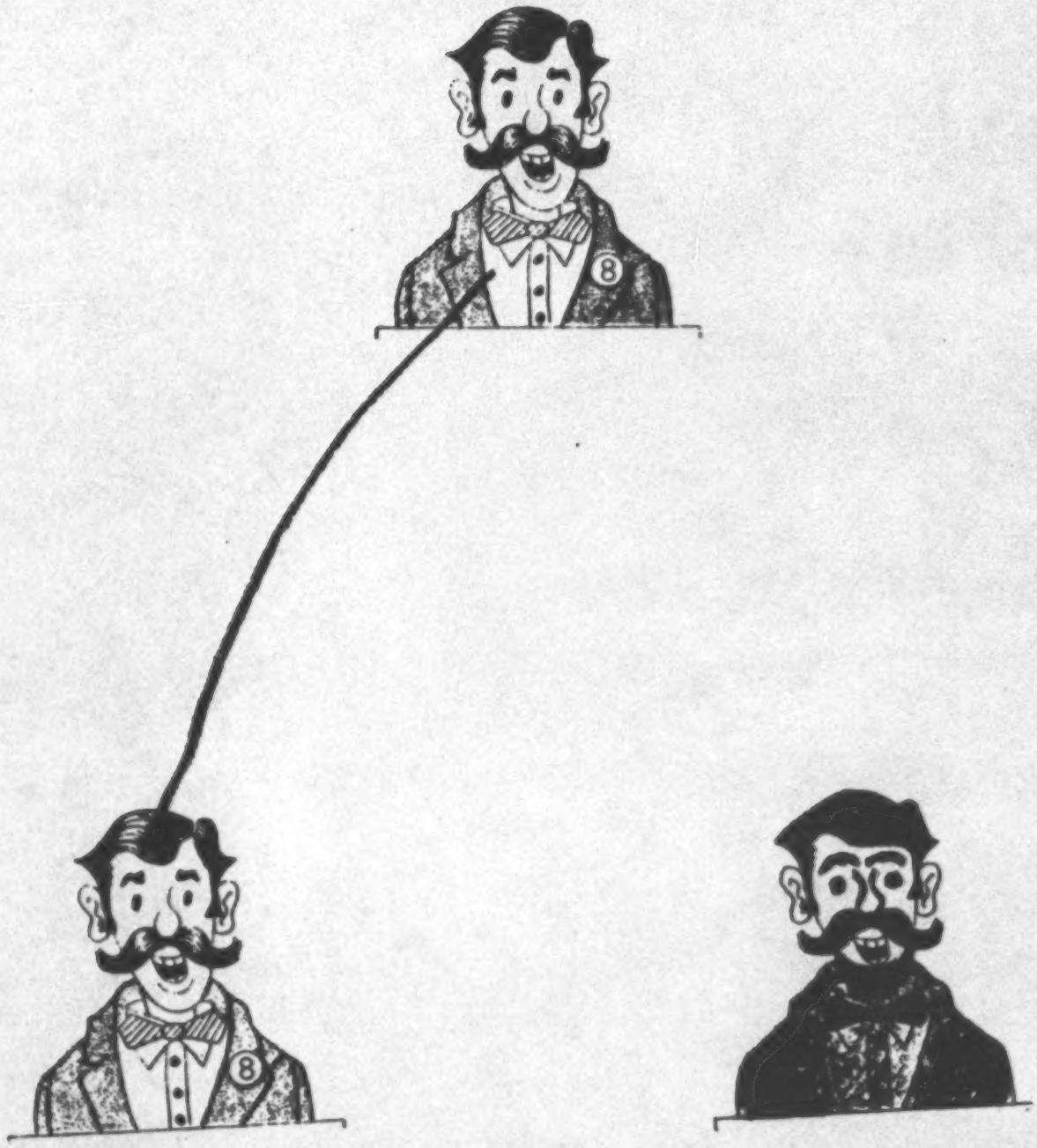
30)
CLICK
CLICK CLUCK

Appendix B



Sample page from Self Instructional Lesson
(properly marked by a child)

Appendix B



Sample page from Self Instructional Lesson
(properly marked by a child)

Appendix C

Table I

Analysis of Variance of First and Second Conditioning Scores of Children Unclassified in First Session

Source	SS	df	F
Between Cells	483.97	31	
A (Dep-Non Dep)	22.78	1	1.48
Ss within groups	461.19	30	
Within Ss	1280.00	96	
B (Reward)	294.03	1	35.42**
A x B	13.78	1	
B x Ss within groups	249.18	30	
C (Session)	108.78	1	8.48**
A x C	1.53	1	.11
C x Ss within groups	384.69	30	
B x C	75.03	1	13.09**
A x B x C	.78	1	.49
B x C x Ss within groups	152.19	30	

** significant at the .01 level

Appendix C

Table II

Analysis of Variance of Trials-to-Criterion Scores of Tangibles Conditioned to Approval

Source	SS	df	F
Between Cells	156.87	39	
A (Conditioning groups)	5.71	3	.45
Ss within groups	151.16	36	
Within Ss	104.03	40	
B (Reward condition)	9.09	1	3.48
A x B	.98	3	.12
B x S within groups	93.96	36	

Appendix C

Table III

Analysis of Variance of Extinction Scores of Tangibles Conditioned to Approval

Source	SS	df	F
Between Cells	147.89	39	
A (Conditioning groups)	10.74	3	.94
S Within groups	137.15	36	
Within Ss	138.50	40	
B (Rewards)	9.12	1	2.64
A x B	4.83	3	.46
B x Ss within groups	124.55	36	

Table IV

Analysis of Variance of Transformed Trials-to-Criterion Scores for Approvals Conditioned to "Correct"

Source	SS	df	F
Between Cells	88.21	24	
A (Conditioning groups)	1.18	2	.15
Ss within groups	87.03	22	
Within Ss	99.94	25	
B (Reward)	12.70	1	3.28
A x B	2.03	2	.26
B x Ss within groups	85.21	22	

Appendix C

Table V

Analysis of Variance of Extinction Scores of Approvals Conditioned to "Correct"

Source	SS	df	F
Between Cells	77.00	24	
A (Dep-Non Dep-Control)	.46	2	.07
Ss within groups	76.54	22	
Within Ss	45.00	25	
B (Reward)	2.00	1	1.41
A x B	11.69	2	4.12*
B x Ss within groups	31.31	22	

Table VI

Analysis of Variance of Self-Instruction Scores

Source	SS	df	F
Between Cells	24.1	2	1.81
Within Cells	179.4	27	
Total	203.5	29	

Appendix D

Questionnaire

Please try to answer these questions when the child is present in class.

I. Attitude: What is the child's attitude toward school?

_____ a) He seems to like school.

_____ b) He shows some signs that he likes school, but for the most part he is indifferent.

_____ c) He seems to dislike school.

II. Motivation: Does he appear to be trying to learn?

_____ a) In general, Yes.

_____ b) Yes - some of the time; but not always.

_____ c) In general, No.

III. Response to directions: How does he respond to directions?

_____ a) He is usually responsive and attentive.

_____ b) He takes directions but is not always very attentive to them.

_____ c) He is usually inattentive and unresponsive to directions.

IV. Achievement: In general his achievement has been --

_____ A. Excellent

_____ B. Good

_____ C. Fair

_____ D. Poor

_____ F. Very poor (failing)

Scoring: I, II & III	a = 2	IV	A = 4
	b = 1		B = C
	c = 0		C = 2
			D = 1
			F = 0

OE 6000 (REV. 9-66)

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800 ABSTRACT

Two experiments were conducted to classify and to condition reward responsiveness in kindergarten children.

In Experiment 1 it was found that 60 percent of the 200 children studied were highly responsive to tangible rewards, 30 percent were responsive to approval of whom 50 percent responded to confirmation of correct responses, and 10 percent did not show responsiveness to any of the three rewards. Experiment 1 also showed tangible rewards were more effective than approval but approval and confirmation of correct responses were generally similar. No systematic evidence of the conditioning of reward effectiveness was found.

Experiment 2 did show conditioning effects: the quickest and most durable reward conditioning occurred in children exposed to a procedure in which the to-be-conditioned reward first served as a discriminative stimulus and then was conditioned as a reward with the conditioning sequence including a period of reward deprivation.

Evidence was also obtained showing that children who are underachievers in the first grade tend to be low in approval responsiveness.

822

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